ORIGINAL CONTRIBUTIONS

INFLUENZA IMMUNIZATIONS PROVIDED BY EMS AGENCIES: THE MEDICVAX PROJECT

Vince N. Mosesso, Jr., MD, C. Richard Packer, MS, NREMT-P, Joan McMahon, RN, MPH, Thomas E. Auble, PhD, Paul M. Paris, MD

ABSTRACT

Objective. Emergency medical services (EMS) agencies may be an underutilized resource for provision of preventive health services. This study sought to demonstrate the feasibility for EMS agencies to provide influenza immunizations. **Methods**. This prospective, observational cohort study was conducted with urban, suburban, and rural EMS agencies that volunteered to participate. EMS managers and paramedics attended an orientation program, and then developed and implemented recruitment strategies. Adult volunteer subjects who met Centers for Disease Control and Prevention criteria for influenza vaccination were enrolled. Paramedics obtained informed consent, determined subject eligibility, administered the vaccine, and observed each subject for 10 minutes. Paramedics, EMS managers, and subjects completed surveys; EMS managers reported costs and resource utilization. Data were analyzed descriptively. **Results**. Ninety paramedics from 15 EMS agencies in three counties participated. Subjects were recruited by print and broadcast media and enrolled at 73 events held at retail establishments, community events, EMS stations, churches, senior citizen complexes, and private residences. Of the 2,075 adults immunized, 1,014 (49%) did not receive influenza vaccination in the previous year. Seven hundred five (34%) reported that they probably would not have been vaccinated elsewhere. Fixed cost for each immunization was $3.42. The EMS managers estimated their variable costs to range from zero dollars (volunteer agencies with all donated expenses) to $15.31 per immunization. No adverse events were reported. Subjects, paramedics, and EMS managers indicated a high level of satisfaction with the project. **Conclusion**. The MEDICVAX Project demonstrated the feasibility of EMS agencies to safely provide influenza immunizations. The project reached some adults who likely would not have been immunized. **Key words**: emergency medical services; emergency medical technicians; immunization; influenza; preventive health services.

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Influenza leads to needless morbidity and mortality in adult and elderly Americans,[1] accounting for 20,000 deaths and 114,000 hospitalizations among American adults each year.[2] Among persons aged 65 years and older, the influenza vaccination rate was only 63% in 1997.[3] The Centers for Disease Control and Prevention (CDC) recommend immunization against influenza for all persons with emphasis on targeting high-risk groups,[3] which include: persons aged 65 years and older, residents of nursing homes and chronic-care facilities, adults and children with chronic medical conditions, women who will be in their second or third trimester of pregnancy during the influenza season, health care workers, and those who provide care for persons in these groups. The influenza vaccine is 70% to 90% effective in preventing clinical illness of healthy persons aged <65 years and 80% effective in preventing death in older adults.[4,5] Immunization also decreases medical costs.[6] One cost–effectiveness meta-analysis estimated a cost savings of $60,000–$4,000 per illness averted among healthy persons aged 18–64 years.[7]

Despite the devastating consequences of influenza, only 63% of persons over the age of 65 years receive the protection of immunization.[8] The Healthy People 2010 objective is to achieve vaccination coverage for 90% of persons aged 65 years and older.[9] This lack of compliance in receiving influenza immunization is attributed to patient, provider, and systems issues. Patients may not know that they are at risk for this disease or may fear adverse reactions to the immunization. Health care providers may not routinely review their adult patients' immunization status with respect

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Address correspondence and reprint requests to: Vince N. Mosesso, Jr., MD, Department of Emergency Medicine, 230 McKee Place, Suite 500, Pittsburgh, PA 15213. E-mail: <mosessovn@msx.upmc.edu>.

to their lifestyles and occupational exposures. Finally, systems issues related to underimmunization include lack of insurance coverage or inconvenient access.

Similar to emergency department personnel,[10] emergency medical services (EMS) agencies are in an advantageous position to address the lack of widespread immunization. Pilot influenza immunization programs[11] and pediatric immunization programs[12] by EMS agencies have been reported in the literature. EMS agencies are readily accessible to local residents; paramedics reflect the community's composition, as they often live in the communities they serve, where they are known and trusted by local residents.[12] Paramedics are trained and authorized under current EMS regulations to perform intramuscular injections. These factors suggest that delivery by local EMS agencies may be a means to increase rates of immunization.

The MEDICVAX Project was designed to assess the feasibility of EMS agencies providing influenza immunization. The aims of the MEDICVAX Project were to describe the number of immunizations administered; the educational, operational, and administrative resources required; and the perceptions of EMS personnel and study subjects.

Materials and Methods

This prospective, observational cohort study was conducted between October 2 and December 31, 1997, using a convenience sample of EMS agencies and volunteer adult subjects. This Project was approved by the University of Pittsburgh Institutional Review Board and the Pennsylvania Department of Health, in collaboration with the Allegheny County Health Department (ACHD).

Emergency medical services throughout the region were notified of the study and recruited to participate. The EMS managers and project coordinators from interested agencies received a two-hour orientation and training session. The session consisted of the ACHD standard training program for immunization administration and a discussion of the study protocol's purpose, subject eligibility criteria, benefits and risks of participation, the informed consent process, the immunization procedure, and documentation requirements. These representatives trained other participating paramedics at their respective EMS agencies using a "train the trainer" format; a total of 90 paramedics were oriented. The orientation sessions provided opportunities for paramedics to practice intramuscular injections using saline solution and to administer vaccine to each other on a voluntary basis.

The University of Pittsburgh Medical Center Health System (UPMCHS) provided EMS agencies with the required immunization supplies. The agencies provided their own standard emergency medications, equipment, and ice coolers for vaccine storage. The vaccine, provided free of charge by the ACHD, was designated and approved by the CDC for administration to adults in the 1997–1998 influenza season and included A/Bayern/07/95-like (H1N1), A/Wuhan/359/95-like (H3N2), and B/Beijing/184/93-like hemagglutinin antigens.[13]

During the immunization events, paramedics obtained informed consent and determined the subjects' eligibility by asking questions from a standard subject data card. Healthy adults 18 years of age and older were eligible for participation. Adults were excluded for any of the following reasons: 1) severe allergy or anaphylactic hypersensitivity to eggs; 2) allergic reaction or other serious problem after previous administration of vaccines; 3) current acute illness; 4) HIV seropositivity; 5) history of Guillain-Barré syndrome; and 6) pregnancy. Subjects who did not meet inclusion criteria were referred to their primary care physician for evaluation and immunization. Paramedics completed a standard data card to record subject eligibility, demographics, and adverse reactions. Paramedics were instructed to document any adverse drug reactions including hives, angioedema, wheezing, systemic anaphylaxis, or other allergic symptoms. The immunization was administered in the subjects' deltoid muscle. During the subsequent 10-minute observation period, the subjects were asked to complete a nine-question survey. The subjects were queried as to their previous year's immunization history, their satisfaction with the MEDICVAX Project, their reasons for receiving the influenza immunization, and their likelihood for receiving an influenza vaccine had they not participated in the MEDICVAX Project. The paramedics and EMS managers also completed perception surveys, each consisting of nine questions with five-point Likert scale for responses. Both surveys sought to determine their satisfaction with the project. The EMS managers completed a data sheet for each immunization event and a summary report of costs and resource utilization for their EMS agency.

Data were transcribed from the data sheets and entered into a computerized spreadsheet. Data were analyzed using descriptive statistics.

Results

Fifteen community-based EMS agencies in three Western Pennsylvania counties volunteered to participate (Table 1). During the ten-week MEDICVAX Project, 90 EMS personnel immunized 2,075 adults at 73 events. Subject characteristics are described in Table 2. Agencies conducted an average of 6 events (range 1–13). Event venues are listed in Figure 1. Public buildings (22.3%), businesses (19.5%), and EMS stations (6.1%) accounted for more than half of the events. The number of vaccines administered by indi-

TABLE 1. Characteristics of the Participating EMS Agencies (n = 15)

Type of staffing/personnel		
All paid		2 (13%)
Paid/volunteer		5 (33%)
All volunteer		8 (53%)
Agency service area		
Population	*Agencies*	*Immunizations Administered*
Urban	1	21 (0.9%)
Suburban	11	1,635 (77.4%)
Rural	3	456 (21.5%)

TABLE 2. Subject Characteristics (n = 2,112)

Age (n = 2,088)	
Median	48 years
Range	18–92 years
Gender (n = 2,088)	
Male	1,009 (48.3%)
Female	1,079 (51.7%)
Ethnicity (n = 2,080)	
White	2,021 (97.2%)
African American	34 (1.6%)
Other	25 (1.2%)
Resident of EMS service area (n = 2,095)	
Yes	1,239 (59.1%)
No	855 (40.9%)

vidual EMS agencies ranged from 46 to 1,178 (mean = 217). No adverse events were reported.

Costs for the vaccine and administration supplies were $3.42 per dose (wholesale cost of vaccine in 1997 was $1.60/dose). The EMS managers estimated their additional costs to range from zero dollars (volunteer agencies with all donated expenses) to $15.31 per immunization. The EMS managers' and paramedics' perceptions of the MEDICVAX Project are found in Tables 3 and 4, respectively. Managers indicated that the program was an appropriate use of EMS resources and did not interfere with emergency operations; they also noted it was a positive public relations effort. Paramedics agreed with the managers on those issues and expressed interest in participating again in the next year.

The subjects' perceptions (Table 5) revealed that the convenience in receiving the immunization was their primary reason for participation in the MEDICVAX Project. There were 1,011 (48.8%) subjects who reported not receiving the influenza vaccination in the previous year, while 720 (34.5%) subjects reported that they probably would not have been vaccinated elsewhere without the MEDICVAX Project.

DISCUSSION

The MEDICVAX Project demonstrated that EMS agencies can successfully deliver influenza immunization in the local community. The highest-volume immunization events were conducted at locations easily accessible to local residents, such as community centers, businesses, EMS and fire stations, and churches. These types of venues may enhance the attractiveness of receiving the influenza vaccine because of their convenience and close proximity to residences and businesses.

It is note-worthy that three-fourths of the adults receiving the influenza vaccine were 60 years of age or less. The most vulnerable adults, those 60 years of age and older, constituted a small proportion of the vaccinated subjects. Other local agencies reported similar

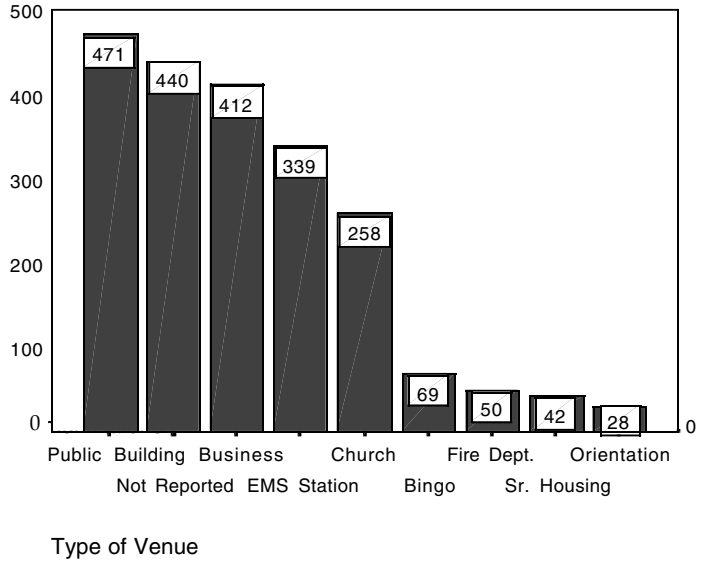

FIGURE 1. Number of immunizations by venue. "Not reported" includes events that were conducted at various types of locations but were not coded to report the specific venue.

TABLE 3. Emergency Medical Services (EMS) Manager Survey (n = 9)

Survey Question	Strongly Agreed	Agreed	Neutral	Disagreed	Strongly Disagreed
Project did not interfere with EMS operations	7 (77.8%)	2 (22.2%)			
Project was an appropriate utilization of agency resources	7 (77.8%)	2 (22.2%)			
Project provided positive publicity	8 (88.9%)	1 (11.1%)			
Would participate next year	11 (100%)				
Project has economic potential	3 (33.3%)		6 (66.7%)		

TABLE 4. Emergency Medical Services (EMS) Provider Survey (n = 32)

Survey Question	Strongly Agreed	Agreed	Neutral	Disagreed	Strongly Disagreed
Project did not interfere with EMS operations	26 (81.3%)	6 (18.8%)			
Project was an appropriate utilization of agency resources	27 (84.4%)	4 (12.5%)	1 (3.1%)		
Project provided positive publicity	27 (84.4%)	4 (12.5%)			
Would participate next year	25 (78.1%)	7 (21.9%)			
Project has economic potential	8 (25.0%)		24 (75%)		
Data forms were easy to complete	4 (12.5%)	28 (87.5%)			
Orientation was effective and efficient	5 (15.6%)	27 (84.4%)			

findings. The Community Health Survey for Northern Allegheny and Southern Butler Counties reported that more than 24.9% of their adult population (>64 years old) had not been immunized for influenza in the past year.[14] Another survey completed by the ACHD indicated that 25% of those 65–79 years old had not received immunization for the 1996–1997 flu season.[15] This has particular significance when one considers that the Western Pennsylvania region contains the second-highest proportion of elderly residents in the country. To reach this susceptible population, EMS and other health care agencies might consider alternative distribution methods and immunization venues, such as increasing the number of events at senior citizen settings (e.g., senior living facilities and community centers). Collaborating with the Department of Aging may help EMS agencies to identify at-risk elderly and target them for home immunization.

White persons accounted for the vast majority of vaccine recipients. Relative to their population, minorities were underrepresented. Culturally sensitive recruitment efforts should be employed to target these underserved groups.

One of the most striking outcomes of the MEDICVAX Project was finding that almost half of the subjects were not immunized in the previous year and another third would not have been immunized elsewhere in the current year. This suggests that the convenience and perhaps familiarity with local EMS may have facilitated some individuals to be immunized.

The MEDICVAX Program shares similar findings with the Rural/Metro Medical Service in Syracuse, New York, whose paramedics visited 15 clinic sites and administered influenza vaccinations to 150 individuals who would have gone without vaccination.[12] In another program, "Shots over Texas," 37 paramedics provided 3,633 immunizations to 2,297 children at 77 clinics in more than 20 counties.[13]

From another perspective, influenza immunization provides EMS agencies an opportunity to develop expertise in the operational aspects of mass immunization programs. This experience may be useful if EMS is called upon to assist in immunizing the public during infectious disease epidemics or in response to bioterrorism.

Several limitations of this study should be considered. The EMS agencies who participated were self-selected and thus may not be representative of EMS in general. Some agencies may require organizational and infrastructure modifications. Another weakness of the study was completeness of data collection for each subject and venue. This is a well-recognized challenge in the conduct of prehospital research. In particular, EMS costs were difficult to quantify and compare. Some services used volunteer staff, while others paid, and some receive municipal services such as vehicle maintenance and fuel that skew the true costs of the program. Nonetheless, the costs reported do reflect the impact on the particular agency's budget.

Encouraged by the positive results of this feasibility trial and the interest of local EMS, the MEDICVAX effort was continued in the following years as a nonresearch project. These immunizations were administered under the authority provided by Section 17 of the Pennsylvania Medical Practice Act.[16] In 1998, 18 EMS agencies participated and provided 5,869 immunizations; these numbers rose to 32 agencies and nearly 10,000 immunizations in 1999. One might ask whether these EMS agencies saved more lives through influenza immunizations than emergency responses.

TABLE 5. Patient Survey (n = 2,087)

How learned of project	
Newspaper	36%
Mailings	31%
Sign	5%
Other	25%
Not immunized last year	49%
Reasons for obtaining immunization through MEDICVAX Project	
Convenience	84%
No cost	46%
No other access	2%
If not immunized today, would *not* have obtained elsewhere	34%
Project was organized and efficient	98%
Would use EMS next year for flu shot	82%

CONCLUSION

The MEDICVAX project provided an opportunity for EMS to develop a partnership with public health in delivering an illness prevention service. The participating EMS agencies demonstrated the ability to safely and effectively provide influenza immunizations to the community.

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